

WHAT IS CLAIMED IS:

1. A spa control system for monitoring the temperature of water in the system, comprising:

a heating element for heating the water;

a first sensor for detecting the temperature of the water at a selected location;

a second sensor for detecting the temperature of the water at a selected location; and

a microcomputer for processing signals generated by said sensors, wherein said microcomputer is capable of selectively activating and deactivating said heating element.

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2. A spa control system as recited in Claim 1, wherein said microcomputer is capable of calculating the difference between the temperatures detected by said sensors.

3. A spa control system as recited in Claim 2, wherein said microcomputer is capable of deactivating said heating element when the temperature difference exceeds a selected amount.

4. A spa control system as recited in Claim 2, further comprising a display which is capable of being activated by said microcomputer when said temperature difference exceeds a selected amount.

5. A spa control system as recited in Claim 2, further comprising a display activated by said microcomputer when said temperature difference is less than a selected amount.

6. A spa control system as recited in Claim 1, wherein the water flows past said heating element, said first sensor detects the temperature of the water upstream of said heating element, and said second sensor detects the temperature of said water downstream of said heating element as the water flows past said heating element.

7. A spa control system as recited in Claim 1, wherein said microcomputer is capable of sensing the signals generated by said first and second sensors and is capable of calculating the rate of increase in the temperature of the water.

8. A spa control system for determining the time necessary to heat the water in the system from an initial temperature to a selected temperature, comprising:

a heating element for heating water;

a sensor for detecting the temperature of the water; and

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a microcomputer for processing signals generated by said sensor and for selectively activating and deactivating said heating element, wherein said microcomputer is capable of assessing the initial temperature of the water, of activating said heating element to increase the temperature of the water, of deactivating said heating element after the water has been heated to a selected temperature, and of assessing the time necessary to raise the temperature of the water from the initial temperature to the desired temperature.



9. A spa control system as recited in Claim 8, wherein said microcomputer is capable of calculating the rate of heating of the water.

10. A spa control system as recited in Claim 9, wherein the rate of heating is stored by the microcomputer.

11. A spa control system as recited in Claim 9, wherein said microcomputer is capable of calculating a cumulative, average rate of heating by averaging the rate of heating, determined each time that the spa water is heated, with the rate of heating previously calculated for the spa system.

12. A spa control system as recited in Claim 10, wherein said microcomputer is capable of determining the temperature difference between the selected temperature and the initial temperature, of assessing the rate of heating, and of calculating the amount of time necessary to heat the water from the initial temperature to the desired temperature.

13. A spa control system as recited in Claim 12, wherein said microcomputer is capable of assessing the initial temperature of the water, the rate of heating, the desired time at which the water temperature will equal the selected temperature, and wherein said microcomputer is capable of determining the start time necessary for activating said heating element so that said water is heated to the selected temperature at the desired time.

14. A spa control system for heating the water in the system from an initial temperature to a selected temperature at a desired time, comprising:

a heating element for heating the water;

a sensor for detecting the temperature of the water; and

a microcomputer connected with said heating element and said sensor which is capable of assessing the initial temperature of the water, the average rate of heating, and is capable of determining the start time

necessary for activating said heating element so that said water is heated to the selected temperature at the desired time.

15. A spa control system as recited in Claim 14, wherein said microcomputer is capable of deactivating said heating element when the temperature of the water equals the selected temperature.

16. A spa control system as recited in Claim 15, wherein said microcomputer is capable of deactivating said heating element when the temperature of the water equals the selected temperature.

17. A spa control system as recited in Claim 16, further comprising a display which is capable of being activated by said microcomputer when the temperature of the water equals the selected temperature.

18. A spa control system which contains water in the system and which is powered by a power source, comprising:

a heating element for heating the water;

a low speed pump for circulating the water in the spa control system;

and

a microcomputer for determining the voltage of the power source, wherein said microcomputer is capable of setting a flag in the memory of said microcomputer to indicate the voltage of the power source.

19. A spa control system as recited in Claim 18, wherein a flag is set in the memory of the microcomputer if the voltage of the power source is 110 volts.

20. A spa control system as recited in Claim 19, further comprising a high speed pump.

21. A spa control system as recited in Claim 20, wherein said heating element and said low speed pump are deactivated when said high speed pump is activated.

22. A spa control system as recited in Claim 19, further comprising a blower.

23. A spa control system as recited in Claim 22, wherein said heating element and said low speed pump are deactivated when said blower is activated.

24. A spa control system as recited in Claim 21, further comprising a display which is capable of indicating when said heating element is deactivated.

25. A spa control system for monitoring the temperature of water in the system, comprising:

a heating element for heating the water;

a first sensor adjacent to said heating element for detecting the temperature of the water at said heating element;

a second sensor for detecting the temperature of the water at a selected location;

a pump which is capable of being activated to circulate the water in the system; and

a microcomputer for processing signals generated by said sensors, wherein said microcomputer is capable of calculating the difference between the temperatures detected by said first sensor and said second sensor at a selected time after said pump is activated.

26. A spa control system as recited in Claim 25, wherein said microcomputer is capable of selectively activating and deactivating said heating element if the temperature difference, calculated five minutes after said pump is turned on, exceeds six degrees Fahrenheit.

27. A spa control system as recited in Claim 26, wherein said microcomputer is capable of deactivating said heating element if the temperature of said

first sensor exceeds the temperature of said second sensor by more than six degrees Fahrenheit.

28. A spa control system as recited in Claim 236, wherein said microcomputer is capable of activating said heating element if the temperature of said first sensor is more than six degrees less than the temperature of said second sensor.

29. A spa control system for monitoring the temperature of water in the system, comprising:

a heating element for heating the water;

a pump for circulating the water in the system;

a sensor for detecting the temperature of the water at a selected location; and

a microcomputer for processing signals generated by said sensor, wherein said microcomputer is capable of deactivating said heating element and said pump when said sensor detects a water temperature equal to or less than thirty-four degrees Fahrenheit.

30. A spa control system as recited in Claim 29, further comprising a blower which is capable of being deactivated by said microcomputer when said sensor detects a water temperature equal to or less than thirty-four degrees Fahrenheit.

31. A spa control system for monitoring the temperature of water in the system, comprising:

a heating element for heating the water;

a pump for circulating the water in the system;

5 a sensor for detecting the temperature of the water at a selected location; and

a microcomputer for processing signals generated by said sensor, wherein said microcomputer is capable of activating said pump for a selected time when said sensor detects a water temperature equal to or less than thirty-eight degrees Fahrenheit.

10 32. A spa control system as recited in Claim 31, wherein said microcomputer is capable of activating said pump for a five minute period when said sensor detects a water temperature equal to or less than thirty-eight degrees Fahrenheit.

33. A spa control system as recited in Claim 32, wherein said microcomputer is capable of activating said heating element if the temperature of the water, at the end of said five minute period, is equal to or less than thirty-eight degrees Fahrenheit.

34. A spa control system as recited in Claim 33, wherein said microcomputer is capable of monitoring the temperature of the water at five minute intervals after said heating element is activated, and wherein said microcomputer is further capable of deactivating said heating element when the temperature of the water exceeds
5 forty degrees Fahrenheit.

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